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USING TIME DELAY TO PROMOTE SPONTANEOUS SPEECH IN AN AUTISTIC CHILD

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One of the frequently observed deficits in autistic children is their lack of spontaneous speech. We used a multiple baseline across behaviors to investigate the effectiveness of a time delay procedure for inducing spontaneous speech in a 10-year-old male autistic child during play. We first taught the child to imitate the experimenter's verbal prompts that described the child's motor response. Once the child reached criteria on imitation, we implemented baseline wherein an immediate verbal prompt for speech was provided after each of the child's motor responses. Intervention consisted of a gradual delay in the presentation of the verbal prompts. The time delay effectively increased the child's spontaneous speech on trained items; some generalization to untrained items also occurred, but only within the same behavioral class of car play. Generalization was also observed across settings. Spontaneous speech remained at high levels during the 4-month maintenance for the behavior of car play but decreased for a second behavior. Decreases in the child's response latencies suggest that spontaneous speech may be an anticipatory verbal response.

DESCRIPTORS: time delay, autistic children, speech

An autistic child, faced with a nonverbal cue, will rarely make a spontaneous verbal response (e.g., Charlop, Schreibman, & Thibodeau, 1985). That is, the autistic child remains silent and speaks only when verbally prompted by another person with a question or command. This failure to use speech spontaneously appears unnatural to others and is a hindrance to normal communication—a special concern among educators and parents, because of the importance of spontaneous communication in social development.

The time delay procedure has increased spontaneous speech in mentally retarded and autistic children. For example, Charlop et al. (1985) taught children to imitate the instructor's statement of "I want __" in the presence of the appropriate object. Next, a delay was inserted between the presentation of the object and the verbal prompt. All children began requesting desired objects during the time delay. Their requests also generalized across settings, people, and objects. Similarly, Charlop and Walsh (1986) used the time delay procedure to teach autistic children to express affection verbally. The children were instructed to give a familiar person or parent a hug and say, "I like (love) you." Spontaneous verbalizations of affection increased when time delay was implemented and generalized across settings. These results are particularly encouraging because generalization has been difficult to obtain in autistic children (Lovaas, Koegel, Simmons, & Long, 1973). Unfortunately, the durability of these behavior changes produced with the time delay procedure has yet to be demonstrated (see Handen & Zane, 1987); follow-up tests have not been conducted beyond 2 weeks after training (Charlop & Walsh, 1986).

There are many other situations in which "normal" children speak without prompting. In this experiment, the time delay procedure was used to induce spontaneous and task-appropriate speech during play. A child with autism was taught to describe his actions while playing with cars and drawing pictures. A novel aspect of this experiment was the inclusion of a latency measure that provided additional insight into the mechanism underlying time delay. We also conducted generalization tests across settings and behaviors and, most importantly, determined whether any behavioral changes

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would be maintained at 5-week and 4-month follow-up.

METHOD

Subject and Setting

Tom was a 10-year-old boy with autism whose self-stimulatory behavior occurred at a low frequency and usually consisted of hand gazing. His spontaneous speech occurred at a low frequency and involved requesting objects or asking repetitious questions such as "Go home?" or "No school tomorrow?" He had limited experience playing.

The study was conducted 3 days per week at Tom's home. Each session lasted about 30 min. Car play and drawing were chosen as recreational activities because they are normally accompanied by speech in children without handicaps. The experimenter sat on the floor with the car set between her and Tom. A Hot Wheels® Fix and Fill-up Center (Mattel Inc.) and toy car (Matchbox Inc.) were used. During drawing, the experimenter stood next to Tom. A newsprint drawing pad (91 cm by 61 cm) was hung from an easel. Tom drew with Crayola® felt markers.

Target Behaviors

Tom had to be taught the motor and verbal responses. The experimenter began each trial by instructing Tom to carry out a motor response. In drawing, Tom was instructed to draw a sun, bird, balloon, or flower (i.e., "Draw a ___"). In car play, he was instructed to "park the car," "give car gas," "put car on oil rack," or "put car in garage." The experimenter used graduated guidance to teach Tom the correct motor responses until they were well learned. After completing the motor response, the experimenter asked Tom to describe his behavior (e.g., "What did you make?" or "Why did you park the car?"). The verbal responses taught in drawing included, "I made a ___ (sun, bird, balloon, or flower)" and during car play, "going to store," "car needs gas," "car needs oil," and "change tires." Other task-related responses Tom gave were also considered appropriate. If Tom did not respond or responded incorrectly, he was verbally prompted to make the appropriate verbal response. Verbal feedback in the form of praise was also provided to Tom for correct verbal responses. There were 40 trials in each pretraining session. Tom practiced each motor response five times per session. The activities alternated between car play and drawing, with the first activity each session determined randomly. The order of motor responses per activity were random within blocks of eight trials. Baseline was introduced only after Tom's motor and verbal responding was 80% correct for four consecutive sessions.

Dependent Measures

Spontaneous speech was the primary measure of interest. Each trial began with the experimenter providing Tom with an instruction to carry out a motor response. A verbal response uttered by Tom was scored as spontaneous if it occurred without verbal prompting and was task appropriate. Imitated speech was not considered spontaneous speech. In addition, the latency to initiate spontaneous speech following completion of the motor response was measured using a watch with a second hand. The experimenter started timing as soon as Tom completed the motor response. Trials in which spontaneous speech occurred prior to the completion of the motor response were given a latency of 0 s.

Interrater Reliability

A measure of interobserver agreement was obtained by having a second individual view videotapes of the sessions. Interobserver agreement was calculated for two sessions during each experimental condition by dividing the number of agreements by the number of agreements and disagreements and multiplying by 100. Agreements were tallied when both raters scored a trial the same, whereas disagreements were tallied when the raters scored a trial differently. Interobserver agreement averaged 92% for the occurrence of spontaneous speech, with a range of 90% to 94%. Trials in which agreement

for spontaneous speech occurred also had high interobserver agreement for latency ($r = 0.93$).

Design

The experiment used a multiple baseline across behaviors design. After criterion was reached on pretraining, baseline data were collected for car play and drawing. After five sessions of baseline, the time delay procedure was introduced for car play, while drawing remained in the baseline condition for an additional five sessions. Postsession probes were conducted throughout the study, and generalization probes across settings and maintenance probes were conducted after the completion of the time delay intervention.

Procedure

Baseline. The purpose of baseline was to determine whether Tom would label his play behavior spontaneously in the absence of a delayed prompt procedure. The trained responses were to draw a flower, sun, give the car gas, or put the car on the oil rack. The other four responses remained untrained. On each trial, Tom was told to carry out a motor response. For example, the experimenter might say "Draw a sun." When Tom finished drawing the sun, the experimenter would say "I made a sun." This was the 0-s delay or baseline condition. Any speech that occurred prior to the completion of the motor response was scored as spontaneous. If Tom imitated the verbal prompt within 10 s after prompting, his response was correct but not spontaneous. Verbal prompts were provided for incorrect motor and verbal responding, and feedback was provided for correct verbal responses. Zero, 16, or 32 trials of the 48 trials per session were baseline trials, depending on whether zero, one, or two activities, respectively, were in the baseline phase.

Time delay. In time delay, the trials were the same as baseline except the experimenter waited a brief time before giving the verbal prompt after the completion of the motor response. These brief delays were gradually lengthened over sessions. In the first session of time delay, the first eight time delay trials consisted of 2-s delays and the next eight trials consisted of 4-s delays. In the second session, the first eight time delay trials consisted of 6-s delays and the next eight trials consisted of 8-s delays. After this, all delays were 10 s. Prompting and feedback were provided as in the baseline phase. During Training Session 14 only, the child was reinforced with edibles for producing the trained responses.

Each session consisted of a total of 48 trials, of which 32 were training trials. Some of the training trials were baseline and some were time delay trials. Each trained response was presented eight times. The car play and drawing activities were alternated every eight trials. Within each block trial orders were randomized.

Postsession probes. Postsession probes were used to determine whether spontaneous speech generalized to the untrained responses. Sixteen postsession probes were conducted at the end of each baseline or time delay session. The untrained responses included drawing a bird or balloon, parking the car, and putting the car in the garage. Each response was presented four times. The probes were exactly the same as time delay trials except no verbal prompts or feedback was ever provided. Latency of response was measured. If Tom did not speak within 10 s of the command, the trial was scored as no spontaneous speech.

Generalization and maintenance. Generalization probes across settings were used to determine if learning would transfer to another setting. These probes were conducted in a different room of Tom's house 3 and 10 days after the last session of the time delay condition. These trials were conducted in the same way as the probe trials, except that the four trained responses were also included. No prompting or feedback was provided. There were 32 trials per session, consisting of four trials of each of the eight responses (four trained and four untrained). Maintenance probes were also conducted at 5 weeks and 4 months after intervention. These probes were conducted in a similar manner as the generalization-across-settings probes, except testing occurred in the same room as the original training.

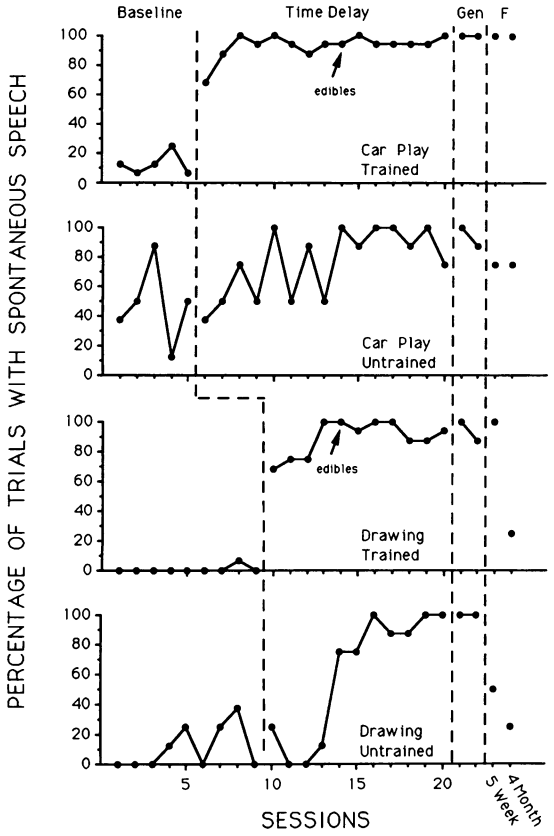

Figure 1. The percentage of spontaneous speech during car play and drawing. The upper panel of both car play and drawing indicate the amount of spontaneous speech that occurred to the trained responses during baseline, time delay, generalization across settings (GEN), and the 5-week and 4-month follow-up (F). The lower panel of both car play and drawing indicate the amount of spontaneous speech that occurred to the untrained stimuli during the postsession probes.

RESULTS

Tom's percentage of spontaneous speech is presented in Figure 1. The upper panel of car play and the upper panel of drawing show the behaviors receiving time delay training. The lower panel of car play and the lower panel of drawing show the untrained behaviors.

Trained. In the baseline condition, spontaneous speech varied from 6% to 25% for the trained behaviors in car play. Spontaneous speech occurred only in one session for drawing. Spontaneous speech immediately increased when the time delay procedure was introduced and was maintained at very high levels.

Untrained. After the time delay procedure was introduced for trained items for car play, the child's spontaneous speech on untrained trials continued to be somewhat variable during the first eight sessions, but was maintained at high levels during the remaining seven sessions. In contrast, spontaneous speech for drawing occurred at low levels for the first four sessions after time delay was implemented and then increased dramatically and was maintained at high levels.

Generalization and maintenance. Spontaneous speech occurred at high levels during both activities on trained and untrained items during generalization across settings. The level of responding was comparable to that observed in the latter sessions of time delay and postsession probes. During the 5-week follow-up, spontaneous speech was maintained at high levels in car play on both trained and untrained items and in drawing on trained items. Spontaneous speech dropped to 50% during drawing on untrained items. During the 4-month follow-up, spontaneous speech continued to occur at high levels during car play on both trained and untrained items. During drawing, spontaneous speech dropped to 25% on trained items and untrained items.

Latency. The latency data for the postsession probes and generalization are presented in Figure 2. Latency was not collected for the trained items. If no spontaneous speech occurred during the session, no data point is given.

In both car play and drawing, there was a marked decrease in the latency of spontaneous speech over sessions. In car play, the latency of spontaneous speech dropped from a mean of 6.2 s to 1.5 s. In drawing, the latency of spontaneous speech dropped from a mean of 5.5 s to 0.69 s.

DISCUSSION

The results of this experiment demonstrate that the time delay procedure was effective in increasing the child's spontaneous speech during car play and drawing. These results confirm previous investigations (e.g., Charlop et al., 1985; Charlop & Walsh, 1986; Halle, Baer, & Spradlin, 1981; Hal-

le, Marshall, & Spradlin, 1979) that used the time delay procedure to increase spontaneous speech. Spontaneous speech also increased with the untrained items for car play, indicating that generalization occurred within the same behavioral class; that is, from trained items of car play to the untrained items of car play, but not from trained items of drawing to the untrained items. We introduced edibles for the trained behaviors in Session 14 only to encourage motivation to attend to the task. This resulted in generalization from the trained items of drawing to the untrained items. These results complement those of Charlop et al. (1985), who found generalization between trained and untrained items within the same behavioral class. Spontaneous speech also generalized across settings during both activities, confirming the results of Charlop et al. (1985) and Charlop and Walsh (1986).

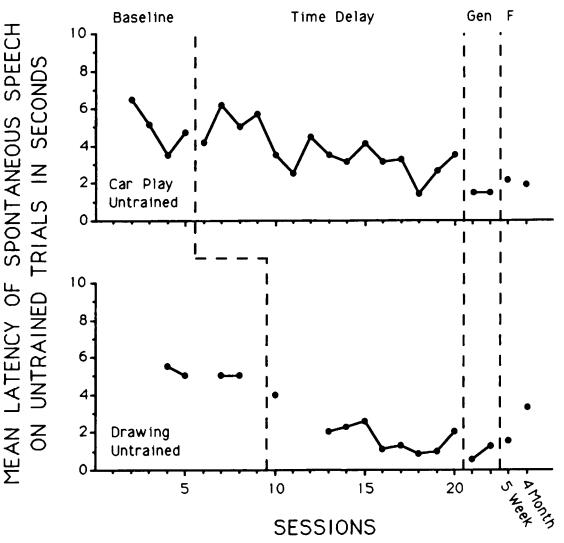

Figure 2. The mean latency in seconds of spontaneous speech for the untrained behaviors during car play and drawing. Missing data points indicate sessions during which no spontaneous speech occurred.

Spontaneous speech continued to occur at high levels during car play at 5 weeks and 4 months following intervention. In contrast, spontaneous speech during drawing decreased to near-baseline levels at 4 months. There are a number of possible reasons for the discrepancy in the maintenance of spontaneous speech during car play and drawing. One possibility is that behaviors well learned, and with which the subject has greater competence, are retained for longer periods. The results of pretraining support this possibility. Fifteen sessions were required before criteria were reached on car play, whereas 23 sessions were required for drawing.

A second possibility, not easy to dismiss, is that the child had practice with one activity during the interval between training and the maintenance sessions. If so, it is likely that those behaviors would be retained over time. In fact, Tom's mother indicated that her son occasionally played with a car set at home. She was uncertain whether her son spoke while playing with his cars, but his play was task appropriate. She also reported that Tom drew infrequently and rarely did this on his own. His drawings usually consisted of random scribblings or drawing circles. The mother did not recall instances of speech by her son while he was drawing. Because the child did not draw identifiable pictures, he may have been less likely to describe his behaviors verbally. Therefore, differences in experience with materials could have made a difference in degree of maintenance. This suggests that care should be taken to select activities likely to be used in a child's daily life when designing interventions to increase spontaneous speech, particularly if speech is paired with specific motor responses.

Because this is the first experiment to examine retention of spontaneous speech over long periods of time, it is difficult to make strong generalizations about other children with autism. Replication with a larger number of subjects is clearly needed. Even so, these data indicate there may be some basis for concern over the durability of the behavior changes produced by time delay, especially for the drawing behavior.

It is interesting that high levels of spontaneous speech did not occur during the early sessions. It was not until a delay was inserted between the completion of the motor response and the verbal prompt that spontaneous speech began to appear. Why might this be the case? The latency data during postsession probes may provide some insight into this question. These data indicate that the first

few instances of spontaneous speech occurred many seconds after the completion of the motor response. The latency to respond then rapidly decreased with training. This pattern of results supports Touchette's (1971) explanation of the mechanism of the time delay procedure. Touchette argued that over trials, the subject comes to anticipate the delayed prompt and responds in anticipation of it. Our results indicate that anticipatory responding initially occurs just before the verbal prompt, and then with additional training, moves closer to the motor response, just as any anticipatory response (e.g., Pavlov, 1927).

Although we have suggested that the motor response was the discriminative stimulus controlling spontaneous speech, it is also possible that the experimenter's command was the functional stimulus for the verbal behavior. It seems more likely that the motor response was the discriminative stimulus because it had the closest temporal proximity to the child's speech. The motor response immediately preceded spontaneous speech, whereas the experimenter's verbal command occurred well before that.

Although this study has demonstrated the effectiveness of the time delay procedure in promoting an autistic child's speech during play, additional research is needed. For example, to avoid possible carryover effects, it might be useful to delay the postsession probes until well after the training session. The generality of the time delay procedure should also be examined by monitoring the subject outside of the experimental sessions and recording instances of spontaneous speech. It would also be interesting to note what percentage of the child's "spontaneous" speech was novel as opposed to being previously trained. Although these data were not collected during our study, we believe that most of Tom's verbal responses were repetitions of the experimenter's original comments. In any case, this experiment provides new data on latency and the durability of behavior change.

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